

CLAIMS

WHAT IS CLAIMED IS:

1. A sealing system for maintaining a pressure barrier between two volumes of different pressure while facilitating the passing of objects therethrough, said system comprising
a foam seal forming a barrier between said two volumes.
2. A system according to claim 1, wherein
said foam seal has at least one passage therethrough for said passing of objects which is in a closed position when said seal is at rest, and which assumes an opened position when said objects are passed through.
3. A system according to claim 1, wherein
said foam seal is comprised of a closed cell foam material.
4. A system according to claim 1, wherein
said foam seal is generally disc-shaped.
5. A system according to claim 1, wherein
said foam seal is generally cylindrical-shaped.
6. A system according to claim 1, wherein
said foam seal is comprised of an opened-cell foam.
7. A system according to claim 1, wherein
said foam seal is comprised of polyurethane.
8. A system according to claim 1, further comprising
a housing structure to hold said foam seal in a position between said volumes in a manner in which said foam seal is compressed.
9. A system according to claim 8, wherein
said seal is compressed in a direction generally parallel to a horizontal plane.

10. A system according to claim 8, wherein
said seal is compressed in a direction generally parallel to a vertical plane.
11. A system according to claim 8, wherein
said seal is compressed in a direction generally parallel to a horizontal plane and generally parallel to a vertical plane.
12. A system according to claim 1, further comprising
a housing structure to hold said foam seal in a position between said volumes, said housing structure having an inside diameter $d1$;
said foam seal having an outside diameter $d2$; and
 $d2$ is greater than $d1$.
13. A system according to claim 1, further comprising
a housing structure to hold said foam seal in a position between said volumes, said housing structure having an interior height $h1$ representing the distance between the floor and the ceiling of the interior of said housing structure;
said foam seal having a height of $h2$; and
 $h2$ is greater than $h1$.
14. A system according to claim 2, wherein
said passage is formed by a slit through said seal.
15. A system according to claim 2, wherein
said passage is formed by a slot-shaped hole through said seal.
16. A system according to claim 2, wherein
said passage is formed by a plurality of slits through said seal that intersect at a common point.
17. A system according to claim 1, further comprising
a plurality of passages formed through said seal.

18. A system according to claim 1, further comprising

a housing structure to hold said foam seal in a position between said volumes, said housing structure having an inside diameter $d1$;

said foam seal having an outside diameter $d2$; and

$d1$ is greater than $d2$ and said foam seal is movable along a generally horizontal plane.

19. A system according to claim 1, further comprising

a housing structure to hold said foam seal in a position between said volumes, said housing structure having an inside diameter $d1$;

said foam seal having an outside diameter $d2$; and

$d1$ is greater than $d2$ and said foam seal is anchored against movement along a generally horizontal plane.

20. A system according to claim 1, further comprising

a housing structure to hold said foam seal in a position between said volumes, said housing structure having an interior height $h1$ representing the distance between the floor and the ceiling of the interior of said housing structure;

said foam seal having a height of $h2$; and

$h1$ is greater than $h2$.

21. A system according to claim 1, further comprising

a housing structure to hold said foam seal in a position between said volumes, said housing structure having an inside diameter $d1$;

said foam seal having an outside diameter $d2$;

$d1$ is greater than $d2$;

said housing structure having an interior height $h1$ representing the distance between the floor and the ceiling of the interior of said housing structure;

said foam seal having a height of $h2$; and

h_1 is greater than h_2 .

22. A system according to claim 1, further comprising

a housing structure to hold said foam seal in a position between said volumes;

a top opening formed in an upper surface of said housing and positioned generally above said passage; and

a planar adapter adapted to be selectively positioned over said top opening, said adapter having an opening of a diameter different than the diameter of said top opening.

23. A system according to claim 1, further comprising

a housing structure to hold said foam seal in a position between said volumes, said housing comprising a movable component and a stationary component;

said movable component comprising a generally spherical part having a top opening, a bottom opening, and a passage therethrough;

said movable component being mounted to said stationary component; and

said foam seal being mounted across said top opening.

24. A system according to claim 1, wherein

said passage has a maximum horizontal dimension of approximately 4 mm.

25. A system according to claim 24, wherein

said passage is adapted to stretch open to a diameter of approximately 12 mm.

26. A system according to claim 24, wherein

said passage is adapted to stretch open to a diameter of about 15 mm.

27. A system according to claim 1, wherein

said foam seal comprises foam cells of diameters averaging approximately 0.32 mm.

28. A system according to claim 1, wherein

said foam seal comprises closed foam cells of diameters averaging approximately 0.32 mm.

29. A trocar system comprising

a trocar housing having a top, a bottom, a sidewall section, an interior chamber, a top opening in said top and in communication with said interior chamber, and a bottom opening in said bottom and in communication with said interior chamber;

a tube extending downwardly from said housing and being in communication with said interior chamber; and

a foam seal having at least one passage therethrough and being mounted in said interior chamber.

30. A system according to claim 29, further comprising

a second seal positioned in said tube, said second seal having a seal passage therethrough adapted to selectively allow passing of objects through said second seal, and said second seal adapted to seal against pressure exerted upwardly against said second seal.

31. A method of providing an access port in a patient's body, said method comprising

inserting into said patient's body a first end of a tube, said tube being connected at its other to a seal housing;

passing at least one object through a foam seal positioned in said housing and through said tube.

32. A method according to claim 31, further comprising

passing at least one object through a secondary seal positioned in said tube.

33. A method of providing an access port in a patient's body for performing a surgical procedure therethrough, said method comprising

inserting into said patient's body a first end of a tube, said tube being connected at its other to a seal housing;

performing a procedure through a foam seal positioned in said housing and through said tube.

34. A method according to claim 33, further comprising

performing a procedure through a secondary seal positioned in said tube.

35. A system according to claim 1, further comprising

a housing structure to hold said foam seal in a position between said volumes in a manner in which said foam seal is compressed and adapted to remain in compression during passing of objects up to at least 14 mm in diameter through said seal.

36. A sealing system for maintaining a pressure barrier between two volumes of different pressure while facilitating the passing of objects therethrough, said system comprising

a plurality of foam seals forming a barrier between said two volumes.

37. A system according to claim 36, wherein

said plurality of foam seals are stacked relative to one another to form a plurality of generally horizontal layers.

38. A system according to claim 1, further comprising

an elastomeric membrane covering at least one surface of said seal.

39. A system according to claim 36, further comprising

an elastomeric membrane covering at least one surface of one of said seals.

40. A system according to claim 1, further comprising

an elastomeric membrane covering all surfaces of said seal.

41. A system according to claim 36, further comprising

an elastomeric membrane surrounding said plurality of seals.

42. A system according to claim 1, further comprising

a plurality of ribs formed in said passage, said ribs being adapted to flexibly engage an object passing through said passage.

43. A system according to claim 1, wherein

said passage has a varying diameter.

44. A system according to claim 43, wherein

said diameter is smallest in a section of said passage between a top surface and a bottom surface of said seal.